Zurich's S-Bahn network has 61 air-conditioned Desiro double deck multiple unit trains in operation.

Passenger-kilometers traveled in the year 2011

Rail:
20,956 million km

Public road transport:
3,047 million km

Total public passenger transport:
28,919 million km

Private road transport:
89,949 million km

Total passenger transport:
118,868 million km

(Source: Litra Informationsdienst)

to ensure timetable stability throughout Switzerland. At the heart of this new construction is the Löwenstrasse through station, around 16 meters below platforms 4 to 9 of the Central Station. It is connected to these platforms and the existing through station Museumstrasse via a new underground shopping mall. The first trains will go into operation here in June 2014, and the total service offered by Zurich S-Bahn will be increased by 25 percent.

Clearly it is often more economical to optimize the existing infrastructure nationwide and only expand at certain points, following the principle of "electronics before concrete." Naturally, this applies to road projects as well.

Build roads or reduce the load?

Despite the high level of investment in public transport, the Swiss freeway network is known as one of the densest in the world: the majority of the population lives less than ten kilometers from the nearest freeway connection. As in other Western European countries, Switzerland went through a phase of mass motorization in the 1950s, leading to greater strain on the city centers, through-roads and bottlenecks. To tackle this state of permanent congestion, in 1960 the parliament passed the National Roads Act. It provides for a freeway network of 1,770 kilometers, which was created over the years that followed. While road building flourished throughout Switzerland, many less frequented rail routes were discontinued.

The consequences quickly became apparent during the economic boom: the capacities of the weakened rail network were no longer sufficient, particularly on transit routes and in the agglomerations around the major economic centers. Even in individual transport the bottlenecks were growing more severe. This led to renewed interest in rail transport: in 2001 a federal law was passed with the aim of shifting a maximum of truck traffic from the highways back on to the rails. In bilateral agreements with the EU, Switzerland committed to building the NRLA and began collecting a mileage-based heavy vehicle fee on all Swiss roads. By 2013 the rail market share had risen to over 66 percent – yet there are still 1.14 million trucks driving through the Alps each year.

Electronics before concrete: traffic management systems

To improve the management of the traffic volume on the existing infrastructure, Siemens technology is in use on many freeways and highways in Switzerland. In the Basle region, for example, a traffic management system has been installed on the A2/A3 freeway between the Schwarzwald Tunnel and the Pratteln exit. It helps to increase the capacity and improve the safety of this route by expanding it from three to four lanes. Meanwhile, in the North Zurich area and the feeder road towards Bülach and the airport, alternative routes can be displayed using dynamic signaling in case of building work, accidents and holdups. These are among the functions performed, almost as background tasks, by the traffic management system Sitraffic.

In this country of many tunnels, a great emphasis is placed on safety systems. For instance, there is a cutting-edge traffic management system from Siemens in operation in the Seelisberg Tunnel, one of the most important constructions on the north-south transit axis. The system controls light signals and variable traffic signs in the two nine-kilometer tunnels (one for each direction), in the two approach zones, and in the connections from Beckenried and Flüelen. In addition, drivers joining via the Flüelen connection can receive precise information from a freely editable text display. In case of a fault, the traffic management functions fully automatically or gives recommendations that have to be confirmed within a defined period. Certain operating modes and individual signals can also be selected manually.

Cities are facing a growing volume of traffic from vehicles searching for parking spaces. To relieve this strain, many cities are turning to car-park routing systems using Siemens technology. St. Gallen, for example, put its system into operation in the year 2000 and has expanded it several times. Today 14 parking lots in the city are linked to 29 static notice signs, 30 dynamic displays and three combined LCD displays. Meanwhile, the canton of Berne has 80 variable LED displays to communicate where there are spaces available at nine parking lots. The displays are linked to the parking-lot routing control center via radio.

Combino tram in the canton of Berne.

Swiss tramways

In 1888 Switzerland opened its first electric tramway, the Vevey–Montreux–Chillon route, which drew its current from a Siemens contact wire. Soon almost every major city was operating a tramway, and in 1925 the Swiss tram network reached its peak total length of 488 kilometers. Today tram lines only remain in Basle, Berne, Geneva, Neuchâtel, Lausanne and Zurich, although their services are constantly being expanded: in 2010 these public transport operators had a combined passenger transportation volume of 28 million tram kilometers.

Since the year 2000 the city of Basle, where the first tram in 1895 was powered by Siemens technology, has been equipped with low-floor Combino trams – 28 of these Combino Classic vehicles are in operation there. Berne also opted for the Combino in the year 2000. With its narrow curve radii, short distances between stops and fast passenger flow, it is specially designed for inner-city use. Today there are 36 of these vehicles, of various models, in use in Berne.

Infrastructure expansion: the people play their part

Infrastructure costs money, and even in Switzerland it doesn't grow on trees. However, the country's particular democratic structures bring about certainty for transport planners. The Swiss voters take more notice of planned projects and financing decisions that their neighbors in other countries – and when it comes to key projects they also play their part. As was the case in the 1990s, in February 2014 a referendum gave the green light – with 62 percent in favor – to spending a grand sum of 6.4 billion francs on upgrading the national rail infrastructure. So there is every chance that the Swiss transport systems will continue running just as we would expect from a model country: perfectly.

On the roads around Zurich, traffic control adjusts dynamically to the current traffic situation.

Mobile control for switching

Modern track systems can often be operated remotely from a central control room. For the new Bockbart freight depot of the Matterhorn Gotthard railway, however, Siemens developed an operating and display system that allows the shunting operations to be controlled autonomously, entirely independently of the control room. This means the shunter can work the switches or track systems from the comfort of the locomotive driver's cab using a touch panel. All necessary information on the switch positions, track settings and occupied tracks are clearly displayed on this mobile touch panel, which can also be operated outside of the shunting locomotive while wearing work gloves. Communication with the interlocking and control system is provided by an encrypted WLAN and fiber-optic connection. There is a also a backup solution: if necessary, the track system can still be operated centrally from the control room.

Rethinking interlocking technology: Anton Reichlin.

Innovative interlocking technology

The communication between the interlocking and the track ensures that rail services run safely. Anton Reichlin, a development engineer at Siemens in Switzerland, has redesigned the network technology and energy supply for these safety systems and has received the Siemens Inventor of the Year 2013 award for this outstanding work. The new network technology, called Sinet, replaces the previous point-to-point connections between the control units and the interlocking with a ring-shaped communication network. This is more reliable and more economical than the aforementioned connections, which are expensive to install. The first Sinet system has been in operation in Sevelen, Switzerland, since October 2013. Five kilometers of a secondary route have been converted to the new technology. Similarly, the Sigrid system aims to replace the cable-heavy point-to-point systems used to supply energy to the element controllers on the track with bus or ring structures. Energy buffers along the tracks also enable the use of thinner cables, reducing the amount of copper needed.

Reactive power compensators stabilize the railway grid.

Mobile reactive power compensators for SBB

By the end of 2015, Siemens will deliver three Sitras RVC plus reactive power compensators to SBB – for first time ever as compact systems housed in mobile 40-foot containers. Equipped with multilevel technology, the especially efficient systems can be quickly transported by road or rail to where they are needed, for example when a stationary system is out of service. Reactive power compensators supply the necessary energy to build up or break down the magnetic field required in the traction motor and in the network. High dependability plays an important role. In railway grids there are often strong voltage fluctuations: when trains accelerate they have a high power uptake, and when they break energy is fed back into the network. Reactive power compensators stabilize the traction voltage directly on-site and ensure stable electricity supply in the overhead lines.

Integrated control and information system

The integrated control and information system Iltis, first developed in the mid 1990s, is constantly being improved. Today, if required, it allows the entire SBB network of around 550 interlockings integrated into the control system to be operated from one location, but the plan is to focus on four operation control centers: in Lausanne, Olten, Zurich Airport and Pollegio. By the end of 2014 the Matterhorn Gotthard railway between Mörel and Münster and between Andermatt and Disentis will also be equipped with nine Simis IS interlockings, eight level crossings and the Iltis control system. ■

Safe thanks to Iltis: the Matterhorn Gotthard railway.